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Attorney Docket No. 02-IMP-068 **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	William F. DiVergilio et al.		
Application No.:	10/702,368	Art Unit.:	1763
Date Filed:	November 6, 2003	Examiner:	Ruby Zerbigon
For:	SEGMENTED RESONANT ANTENNA FOR RADIO FREQUENCY INDUCTIVELY COUPLED PLASMAS		

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Attached herewith, is the APPEAL BRIEF in this application, with respect to the Notice of Appeal filed on October 6, 2006.

Also attached is a check for $500.00 for filing a brief in support of an Appeal.

Applicant believes that no extension of term is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition for extension of time.

The Commissioner is authorized to charge any additional fee which may be required by this notice, or credit any overpayment, to Deposit Account No. 50-1733, EATNP146US.

Respectfully submitted,

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CERTIFICATE OF MAILING

I hereby certify that this paper (along with any paper or item referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first-class mail in an envelope addressed to Mail Stop Appeal Brief - Patent, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Date November 30, 2006 _____
Christine Gillroy

Docket No. 02-IMP-068 EATNP146US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re **PATENT** application of:

Applicant:	William F. DiVergilio et al.
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APPEAL BRIEF

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Dear Sir:

Applicants submit this brief in connection with the appeal of the above-identified case.

I. Real Party in Interest (37 C.F.R. § 41.37(c)(1)(i))

The real party in interest in the present appeal is Axcelis Technologies, Inc.

II. Related Appeals and Interferences (37 C.F.R. § 41.37(c)(1)(ii))

Appellant, appellant's legal representatives, and/or the assignee of the present application are unaware of any appeals or interferences which will directly affect, or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. Status of Claims (37 C.F.R. § 41.37(c)(1)(iii))

Claims 13-29 are pending in the application. Claims 26-29 have been withdrawn from consideration. The rejection of claims 13-25 is appealed.

IV. Status of Amendments (37 C.F.R. § 41.37(c)(1)(iv))

No claim amendments have been entered subsequent to the final rejection.

V. Summary of Claimed Subject Matter (37 C.F.R. § 41.37(c)(1)(v))

According to the invention of independent claim 13 and referring generally to Figs. 3, 5 and 12-14, an ion shower system is provided, and comprises a plasma source operable to generate source gas ions within a chamber 102. The plasma source comprises a plurality of conductor segments 304, and a plurality of capacitors 306, wherein the conductor segments are serially connected through the plurality of capacitors, and wherein the series arrangement of conductor segments and capacitors reside within the chamber. (*See*, *e.g.*, page 19, lines 3-5, and Figs. 12-14). An antenna drive circuit 308 is coupled to the plurality of conductor segments, and is operable to provide power to the conductor segments and capacitors at a predetermined frequency. (*See*, *e.g.*, page 19, lines 5-6, Fig. 14). The plasma source further comprises a source gas inlet 124 that is operable to provide a source gas to the chamber 102. (*See*, *e.g.*, page 9, lines 3-4). The conductor segments, capacitors and antenna drive circuit cooperatively provide energy to charged particles in the chamber, thereby energizing the charged particles and generating a plasma comprising source gas ions and electrons within the chamber due to ionizing collisions between the energized charged particles and the source gas. (*See*, *e.g.*, page 20, lines 5-25). An extraction assembly 116 is further provided, and is associated with the chamber and is operable to extract source gas ions therefrom. (*See*, *e.g.*, page 9, lines 21-23).

Further, in accordance with the invention of claim 16, the ion shower further comprises a feature that the conductor segments have an inductive reactance and the capacitors have a capacitive reactance associated therewith. In the arrangement, one of the conductors and one of the capacitors form an antenna segment, wherein the inductive reactance and capacitive reactance of the antenna segment are equal at the predetermined frequency. (*See*, *e.g.*, Fig. 14; page 21, line 22 – page 22, line 6).

In addition, in accordance with the invention of claim 20, the plurality of conductor segments and capacitors are arranged within the chamber in an azimuthally symmetric

fashion. Accordingly, a non-uniform capacitive electrostatic field component along each conductor segment is repeated in an azimuthally symmetric fashion, and thereby contributes to an azimuthally symmetric plasma within the chamber. (*See, e.g.*, Fig. 12; page 19, lines 22-25; page 22, lines 7-10).

In accordance with the invention of claim 21, a feature of the ion shower comprises the extraction assembly being associated with a top portion of the chamber, wherein the extraction assembly is operable to extract ions vertically from the top portion thereof. (*See, e.g.*, Figs. 3 and 5; page 9, line 21 – page 10, line 10).

VI. Grounds of Rejection to be Reviewed on Appeal (37 C.F.R. § 41.37(c)(1)(vi))

Claims 13-18 and 20-22 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,888,146 (Leung) in view of U.S. Patent Publication No. 2001/0047760 A1 (Moslehi).

Claims 13 and 23-25 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,068,784 (Collins) in view of U.S. Patent Publication No. 2001/0047760 A1 (Moslehi).

Claims 19 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,888,146 (Leung) in view of U.S. Patent Publication No. 2001/0047760 A1 (Moslehi), and further in view of U.S. Patent No. 6,552,295 (Markunas).

VII. Argument (37 C.F.R. § 41.37(c)(1)(vii))

A. REJECTION OF CLAIMS 13-18 AND 20-22 UNDER 35 U.S.C. § 103(a)

Claims 13-18 and 20-22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,888,146 (Leung) in view of U.S. Patent Publication No. 2001/0047760 (Moslehi). Withdrawal of the rejection is respectfully requested for at least the following reasons.

i. Neither Leung nor Moslehi teach or suggest a series arrangement of conductor segments and capacitors residing within the chamber, as

recited in claim 13, and no motivation to modify the references in accordance with this claim feature exists.

Claim 13 is directed to an ion shower system comprising a plasma source and an extraction assembly. The plasma source is operable to generate ions within a chamber, and comprises a plurality of conductor segments and a plurality of capacitors serially connected through the conductor segments, wherein the ***series arrangement*** of conductor segments and capacitors ***reside within the source chamber***. Neither cited reference, alone or in combination, teach this feature.

As conceded in the Office Action, Leung does not teach a series arrangement of conductor segments and capacitors. (*See, e.g.*, O.A., 12/14/05, p. 4, last paragraph). While Moslehi does disclose a series arrangement of conductor segments and capacitors in Figs, 2 and 22, in both instances, ***the capacitors reside external to the chamber***. For example, as described in paragraph 57 in conjunction with Fig. 2 of Moslehi, it states that the "RF contacts 224 and 227 are ***externally*** connected together via an RF capacitor. Similarly, the RF contacts 228 and 232 are linked together *via* another external RF capacitor. These ***external*** capacitor connections (***on atmospheric side of the ICP source***) create a 3-turn inner zone coil with two series capacitors for reduced induced voltage." (Emphasis added) (Paragraph 57, lines 15-21). Similarly, in paragraph 113 in conjunction with Fig. 22, Moslehi states: "[m]oreover, ***external*** inter-segment series capacitors C1 (611), C2 (612), and C3 (613) connect the antenna segments in series within each zone." (Emphasis added) (Paragraph 113, lines 6-9). Therefore the combination of cited references do not teach or suggest the invention as recited in claim 13.

The final Office Action appears to concede that neither reference teaches the feature that the capacitors are located ***within*** the chamber, however, the reference appears to indicate that it would have been obvious to do so. (*See, e.g.*, O.A., 7/6/06, paragraph bridging pages 3 and 4). However, a modification of references is only appropriate when a motivation exists to do so. Motivation for modifying a reference can be found in the teachings of the prior art, in the nature of the problem to be solved, or in the general knowledge of those skilled in the art. MPEP § 2143.01 (*citing* In re Rouffet,

149 F.3d 1350, 1357 (Fed. Cir. 1998)). However, such motivation can not be vague or conclusory, but instead must be ***clear and particular***. In re Dembiczak, 175 F.3d 994, 999 (Fed. Cir. 1999). It is respectfully submitted that the requisite motivation for modifying the art in accordance with the claimed invention does not exist, and therefore such a modification is not proper. If, however, the Examiner believes that such motivation does exist to modify the references to place the capacitors ***within*** the chamber as claimed, applicant respectfully requests that such motivation be identified and explained to meet the clear and particular standard set forth by the Federal Circuit.

For the above reasons claim 13 and its associated depending claims are non-obvious over the cited art. Accordingly, withdrawal of the rejection is respectfully requested.

ii. Neither Leung nor Moslehi teach an inductive reactance of a conductor segment and a capacitive reactance of a capacitor (forming an antenna segment) being equal at the predetermined frequency, as recited in claim 16.

Claim 16 depends upon claim 13, and further recites that an inductive reactance of a conductor segment and a capacitive reactance of a capacitor (that together form an antenna segment) ***are equal at the predetermined frequency of the antenna drive circuit***. In the above manner a resonant circuit exists, wherein the voltage drop across the inductive element (the conductor segment) is equal and opposite to the voltage drop across the capacitor. This feature may be employed advantageously to reduce a magnitude of the voltage drop across multiple antenna segments. (*See, e.g.*, discussion in applicants' specification on page 21, line 21 – page 22, line 3). The Office Action asserts that Moslehi teaches this feature in paragraph 113, lines 13-17, however, ***such discussion does not state that such component reactances are equal as claimed***. Rather, paragraph 113 of Moslehi indicates that an external RF matching network is provided to help improve load matching. Clearly ***if the component reactance values were equal as claimed, presumably resonance would be achieved and the matching network would not be necessary***. Consequently, the teaching of a matching network would appear to suggest that the component reactance

values are ***not*** equal. Therefore Moslehi does not teach this feature, thereby rendering claim 16 non-obvious for at least this additional reason. If, however, the Examiner contends that the reference does teach that the inductive reactance and the capacitive reactance are equal as claimed, applicant respectfully submits a technical explanation showing such equality. Accordingly, withdrawal of the rejection is respectfully requested.

iii. Moslehi does not teach an azimuthally symmetric arrangement of the conductor segments and capacitors, as recited in claim 20.

Claim 20 depends upon claim 13, and further recites that the ***series arrangement*** of conductor segments ***and*** capacitors are arranged ***within*** the chamber in an azimuthally symmetric fashion. Initially, as highlighted above, Moslehi does not teach the ***capacitors arranged azimuthally symmetric within the chamber*** as recited in the claimed invention. While ***conductor*** segments 186, 190 and 194 in Fig. 2 of Moslehi are arranged azimuthally, ***the capacitors that couple such segments together are not arranged in the azimuthally symmetric fashion as claimed***. Rather, such capacitors follow the direction of the jumper water channels 214, 218, 226 and 230 illustrated in Fig. 2, and which is NOT azimuthally symmetric. As can be clearly seen in the figure, ***the series arrangement is not arranged in the azimuthally symmetric fashion as recited in claim 20***, and therefore claim 20 is further non-obvious over the cited art. Accordingly, for at least this additional reason, withdrawal of the rejection is respectfully requested.

iv. Leung does not disclose an extraction assembly associated with a top portion of the chamber, and operable to extract ions vertically, as recited in claim 21.

Claim 21 depends upon claim 13, and further recites that the extraction assembly is associated with a ***top portion of the chamber***, and is ***operable to extract ions vertically*** from the top portion thereof. The cited art does not teach this feature. The Office Action asserts that Leung teaches this feature, citing item 14 in Fig. 3, and further

citing Col. 3, lines 43-44 of the reference. However, Leung does not teach an extraction assembly associated with a ***top portion*** of the chamber that is operable to extract ions ***vertically*** from the top portion of the chamber as claimed. In Fig. 3 of the reference, an ion source has an extraction assembly 14 that is located on a ***side portion of the ion source chamber***, and as described and illustrated, ions that form an ion beam 20 are extracted ***horizontally*** from the side portion of the source chamber. Alternatively, Fig. 9 of the cited reference illustrates an ion source chamber 12, wherein the extraction appears to occur ***at a bottom portion thereof***.

In stark contrast to the teaching of Leung, the present invention extracts ions vertically from a top portion of the source chamber. Such an orientation is not arbitrary; rather, as highlighted in applicants' specification, the inventors of the present invention appreciated that the claimed extraction assembly orientation advantageously reduces contamination at the workpiece. More particularly, if any contaminants exist, they become suspended in the plasma during operation, and such contaminants fall to the bottom of the chamber upon deactivation of the plasma due to the influence of gravity. (*See*, *e.g.*, page 9, line 21 – page 10, line 10 of applicants' specification). Consequently, upon deactivation, any contaminants fall away from the workpiece as opposed to falling toward the workpiece due to gravity (as in Fig. 9 of Leung) or toward the workpiece due to momentum provided thereto due to collisions with extracted ions (as in Fig. 3 of Leung). Clearly then, the cited art does not teach this feature, and the present invention is non-obvious over the cited art. Accordingly, withdrawal of the rejection is respectfully requested for at least this additional reason.

Further, claim 22 further recites a workpiece support structure operable to secure the workpiece having an implantation surface orientated ***facing downward*** toward the extraction assembly. Neither cited reference teach or suggest such a workpiece support structure. Accordingly, claim 22 is further non-obvious over the cited art for at least this additional reason. A reversal of the rejection is therefore respectfully requested.

B. REJECTION OF CLAIMS 13 AND 23-25 UNDER 35 U.S.C. § 103(a)

Claims 13 and 23-25 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,068,784 (Collins) in view of Moslehi. Withdrawal of the rejection is requested for at the least the following reasons.

i. Neither Collins nor Moslehi provides a series arrangement of conductor segments and capacitors within the source chamber, as recited in claim 13.

As stated above, Moslehi does not teach a series arrangement of conductor segments and capacitors ***within the source chamber***, as recited in claim 13. Collins, while not disclosing a series arrangement in any form whatsoever, does teach an RF antenna for a source chamber that is located ***external*** to the chamber. (*See, e.g.*, Col. 8, lines 44-47). Therefore Collins does not remedy the deficiencies in Moslehi. Accordingly, the combination of cited art fail to teach the invention of claim 13, and thus claim 13 and its associated depending claims are non-obvious over the cited art. Accordingly, a reversal of the rejection of claim 13 is respectfully requested.

C. REJECTION OF CLAIM 19 UNDER 35 U.S.C. § 103(a)

Claim 19 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Leung in view of Moslehi, and further in view of U.S. Patent 6,552,295 (Markunas). Withdrawal of the rejection is requested for at the least the following reasons.

As stated above, neither Leung nor Moslehi teach or suggest a series arrangement of conductor segments and capacitors within a source chamber, as recited in claim 13. Claim 19 depends upon claim 13, and thus also recites this feature. Markunas does not remedy the deficiencies of the primary references, and therefore claim 19 is also non-obvious over the cited art.

Further, the Office Action asserts that the combination of the references is proper because all the references relate to systems that use RF oscillator circuits. This assertion does not adequately evaluate whether one of ordinary skill in the art would be motivated to combine together the cited art. Initially, Moslehi and Leung are directed to

implantation systems while Markunas is directed to a plasma furnace for hazardous waste disposal.

For at least the above reasons, it is respectfully submitted that claim 19 is non-obvious over the cited art. Accordingly, a reversal of the rejection of claim 19 is respectfully requested.

D. CONCLUSION

For at least the above reasons, the claims currently under consideration are believed to be patentable over the cited references. Accordingly, it is respectfully requested that the rejections of the pending claims be reversed.

For any extra fees or any underpayment of fees for filing of this Brief, the Commissioner is hereby authorized to charge the Deposit Account Number 50-1733, EATNP146US.

Respectfully submitted,
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CERTIFICATE OF MAILING (37 CFR 1.8a)

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Date: November 30, 2006

Christine Gillroy

VIII. Claims Appendix (37 C.F.R. § 41.37(c)(1)(viii))

1-12. (Canceled).

13. (Previously presented) An ion shower system, comprising:

a plasma source operable to generate source gas ions within a chamber, wherein the plasma source further comprises:

a plurality of conductor segments;

a plurality of capacitors, wherein the conductor segments are serially connected through the plurality of capacitors, wherein the series arrangement of conductor segments and capacitors reside within the chamber;

an antenna drive circuit coupled to the plurality of conductor segments, and operable to provide power to the conductor segments and capacitors at a predetermined frequency; and

a source gas inlet,

wherein the source gas inlet is operable to provide a source gas to the chamber, and wherein the conductor segments, capacitors and antenna drive circuit cooperatively provide energy to charged particles in the chamber, thereby energizing the charged particles and generating a plasma comprising source gas ions and electrons within the chamber due to ionizing collisions between the energized charged particles and the source gas;

an extraction assembly associated with the chamber, and operable to extract source gas ions therefrom.

14. (Original) The ion shower of claim 13, further comprising a workpiece support structure associated with the chamber, and operable to secure the workpiece for implantation thereof of source gas ions from the extraction assembly.

15. (Original) The ion shower of claim 13, wherein first and last conductor segments of the plurality of conductor segments form an input, and wherein the antenna drive circuit is coupled to the input.

16. (Original) The ion shower of claim 13, wherein the conductor segments have an inductive reactance associated therewith, and wherein the capacitors have a capacitive reactance associated therewith, and wherein one of the conductors and one of the capacitors form an antenna segment, wherein the inductive reactance and capacitive reactance of the antenna segment are equal at the predetermined frequency.

17. (Original) The ion shower of claim 13, wherein the plurality of conductor segments and plurality of capacitors form a resonant circuit at the predetermined frequency.

18. (Original) The ion shower of claim 13, wherein the antenna drive circuit comprises an oscillator circuit.

19. (Previously presented) The ion shower of claim 18, wherein the oscillator circuit comprises a push-pull oscillator circuit.

20. (Original) The ion shower of claim 13, wherein the plurality of conductor segments and capacitors are arranged within the chamber in an azimuthally symmetric fashion, wherein a non-uniform capacitive electrostatic field component along each conductor segment is repeated in an azimuthally symmetric fashion.

21. (Original) The ion shower of claim 13, wherein the extraction assembly is associated with a top portion of the chamber, and is operable to extract ions vertically from the top portion thereof.

22. (Original) The ion shower of claim 21, further comprising a workpiece support structure associated with the top portion of the chamber, and operable to secure the workpiece having an implantation surface orientated facing downward toward the extraction assembly for implantation thereof.

23. (Original) The ion shower of claim 13, wherein the chamber further comprises a bottom portion and side portions, and wherein the side portions comprise a plurality of multi-cusp magnet devices operable to produce multi-cusp magnetic fields thereat to facilitate an azimuthal uniformity of plasma within the chamber.

24. (Original) The ion shower of claim 23, wherein the multi-cusp magnet devices comprise electromagnets operable to provide a variation in multi-cusp magnetic field strength at differing positions along the side portions.

25. (Original) The ion shower of claim 24, wherein the electromagnets are independently controllable, thereby facilitating a tuning of the multi-cusp magnetic fields.

26. (Withdrawn) The ion shower of claim 13, wherein the plasma source further comprises two grounding rods operable to collect excess electrons within the chamber during extraction of ions from the top portion thereof.

27. (Withdrawn) The ion shower of claim 26, wherein the two grounding rods are silicon coated, and wherein when one of the grounding rods is grounded, the other grounding rod is negatively biased with respect to plasma within the chamber, thereby causing the other grounding rod to be sputtered by the plasma and substantially preventing the other grounding rod from becoming an insulator due to excessive oxidation thereof.

28. (Withdrawn) The ion shower of claim 27, wherein the two grounding rods are coupled to a square-wave voltage associated with the plasma source, and wherein

a phase difference of the square-wave voltages between the two grounding rods is approximately 180 degrees.

29. (Withdrawn) The ion shower of claim 13, the extraction assembly comprising a plurality of electrodes, wherein a first electrode comprises a plasma electrode having a plurality of extraction apertures associated therewith, and a second electrode comprises an extraction electrode biased negatively with respect to the chamber and disposed between the plasma electrode and the workpiece support structure, the extraction electrode having a plurality of extraction apertures substantially aligned with respect to the plasma electrode extraction apertures, and further comprising one or more interstitial pumping apertures operable to reduce a pressure thereat to a second pressure substantially less than the first pressure.

IX. Evidence Appendix (37 C.F.R. § 41.37(c)(1)(ix))

No additional evidence not already part of the official record is relied upon in the arguments provided herein.

X. Related Proceedings Appendix (37 C.F.R. § 41.37(c)(1)(x))

Not applicable.